

PUBLICATIONS OF THE
HOWE LABORATORY
OF OPHTHALMOLOGY
OF THE
HARVARD MEDICAL SCHOOL

Report of the Howe Laboratory of Ophthalmology - 1944

THE exigencies of war research have largely determined the type of investigation carried on in the Howe Laboratory during the past several years. Many of the studies have had little or nothing to do with ophthalmology. This is perhaps to be regretted, but a laboratory made up of a young and conscientious personnel with diverse training has had no alternative but to enlist its wholehearted cooperation in whatever lines its talents could be used most profitably for the war effort.

Research Directly Connected with the War Effort

The Howe Laboratory group has served and is continuing to serve in three separable capacities as far as war research is concerned. First, a series of studies have been carried out for the Navy dealing, in general, with certain optical aspects of naval armaments. Secondly, a study has been made of the pathologic effect of certain war gases. Thirdly, the staff has cooperated in a heterogeneous group of war studies involving optical, ophthalmological, or other specialized talents possessed by the Howe Laboratory group.

The problems undertaken for the Navy are some of those arising directly out of Fleet operation. The newer techniques of naval warfare have naturally involved optical problems not heretofore encountered—nor, in many cases, anticipated. According to the present arrangement, the problems undertaken by the Howe Laboratory are referred directly by the Navy Department. The expenses are entirely furnished by the Navy through contracts between the Massachusetts Eye and Ear Infirmary and various branches of the Navy. The research is under the direction of Dr. Elek J. Ludvigh, assisted by assigned naval and civilian personnel. Since the work has been developmental as well as investigative, requiring in several instances the con-

struction of pilot models, it has been necessary to rent a machine shop and employ several additional machinists outside the premises of the Howe Laboratory. When, as a consequence of developmental research, some types of apparatus are put into mass production, the Howe Laboratory group act as consultants to the manufacturer. All in all, this has been an interesting adaptation of academic research to practical problems of the moment. However undesirable it might be to continue, in peacetime, investigations having such limited scope and necessarily confidential nature, both of which are alien to academic research, it is, nevertheless, gratifying to record this capacity for conversion to wartime needs.

Studies on the war gases have been continued under the auspices of the Office of Scientific Research and Development and have been carried out by Drs. V. E. Kinsey, W. M. Grant, and D. G. Cogan. In an attempt to obtain an effective therapy for eye injuries from war gases, an extensive investigation has been made of the biologic mechanisms by which these agents exert their toxic effects. This has necessitated a considerable departure from ophthalmology proper. To what extent these studies will be pursued further, will depend on the overall prospects of the War and the probability that war gases will be used. At present the results of the investigations in the Laboratory are submitted to the OSRD in the form of confidential reports which are then circulated to other groups working on war gases in this country and in England. To date, the Howe Laboratory has prepared 45 such reports in the two and one-half years of OSRD contract. It is hoped that after the war the material so presented may form the basis for a series of publications in the general literature.

Aside from the official Navy and OSRD investigation, the entire Laboratory group has made an active effort to cooperate with other studies connected with war research when called upon to do so. It is not surprising that the numerous and varied war researches carried on, especially in and around Boston, bring up incidental problems where the talents or techniques of the Howe Laboratory may be of service. The following projects may be

mentioned specifically. An effort has been made to obtain an efficient type of goggle for specific climatic conditions. Studies on malaria are currently being carried out according to a technique in which the eye is used as an indicator. The common practice of "training" color defective persons to pass the entrance requirements for the Armed Forces has been studied; it has been found that, while the training facilitates passing certain tests, it has no effect upon a color defective person's ability to discriminate between colors of low saturation and intensity such as might be expected to prevail in most distant signal lights. Finally, it may be noted that Dr. Kinsey was on "detached service" for several months of the past year setting up a center in Washington for coordinating the various chemical and biologic aspects of the OSRD studies of insect control.

Research not Directly Connected with the War Effort

During the past year several of the Howe Laboratory staff had the distinct honor of being collectively awarded the Warren Triennial Prize. This prize consisting of \$500 is awarded every three years by the Executive Committee of The Massachusetts General Hospital for the "best dissertation, considered worthy of a premium, on some subject in physiology, surgery, or pathological anatomy." The present award was made to Dr. Cogan, Dr. Kinsey, and Mr. Hirsch for their thesis "Some Physiologic Studies on the Cornea." The substance of this thesis has been published in separate communications during the past several years in the Archives of Ophthalmology. The two communications which appeared during the past year analyzed the permeability properties of the several portions of the cornea to a variety of substances. It was specifically demonstrated that the epithelial and endothelial membranes are permeable to substances having a fat soluble phase while the stroma is permeable only to substances having a water soluble phase. These barrier properties of the surface membranes were shown to be essential for the normal functioning of the cornea, and, in the words of a recent reviewer¹, the investigations in the Howe Laboratory

1. Weymouth F. W.: Ann. Rev. of Physiol. 6: 423 (1944)

"appear to have found a simple underlying principle in the old problem of corneal transparency."

Last year's Report noted the investigation of a substance used in the plastics industry which had caused an epidemic of severe corneal ulcers. This substance was found to be contaminant of the solvent, methyl ethyl ketone, but it was not successfully identified. This year an analogous study was made of the toxic substances employed in a local rubber factory. This study, conducted by Drs. Cogan and Grant, was initiated by the observation of a unique type of keratitis occurring in a group of patients employed in cementing rubber goods. From the epidemiologic point of view, there is little doubt that the responsible agent is butanol vapor; we have, however, failed to reproduce it experimentally. A detailed report of the findings is to appear shortly in the Archives of Ophthalmology.

A group of patients with non-luetic interstitial keratitis and vestibulo-auditory symptoms simulating Meniere's disease has been studied by Dr. Cogan. This is believed to be a hitherto unrecognized clinical syndrome.

Among the non-ophthalmological aspects of the war researches have been several observations on the nutritive requirements of the rat by Drs. Kinsey and Grant. These observations, published, during the past year in *Science*, have shown that all of the nitrogen requirements for growth of the rat could be provided by 10 amino acids.

An article reviewing that portion of the recent biochemical, pharmacological, and toxicological literature which pertains to the eye has been prepared by Drs. Cogan and Grant and will appear shortly in a compendium entitled "Ophthalmology in the War Years."

In keeping with the prime purposes of the Howe Laboratory, an attempt has been made to continue the functions of the Howe Laboratory as a consultative adjunct to clinical medicine and clinical ophthalmology. Dr. Kinsey is currently directing the biochemical phases of a study on the disease "retrolental fibroplasia" which results in blindness in some premature infants. The biochemical study is being carried on in the Pathology

Department of the Harvard Medical School and forms part of a more general investigation being conducted by Dr. Terry of the Massachusetts Eye and Ear Infirmary. Dr. Cogan continues actively in the coordinate studies carried on by the Thyroid Service and Hypertension Service. In the latter instance all patients of that large group which are being studied by Dr. Reginald Smithwick at The Massachusetts General Hospital are also seen in the Howe Laboratory where the vascular changes in the fundi are graded before operation (splanchnicectomy) and periodically after operation. Dr. Cogan also gave a winter course for the resident staff on the clinical physiology of the ocular motor system.

Past and Future

The Howe Laboratory is now sixteen years old. It is an established laboratory for research in ophthalmology. It has a wealth of clinical material at its disposal and a staff that is trained in some of the basic sciences. It is particularly suitable for that type of investigation which has been aptly called interdisciplinary research where cooperative undertakings are made by clinical and basic science departments.

The future of the Laboratory looks relatively bright. The worth of a laboratory such as the Howe Laboratory is attested to by the large number of requests for consultation with other departments and laboratories. But the present organization is inadequate to encompass more than a fraction of the problems and services which could be profitably undertaken. Finances have not been any limitation during the War as the Government has borne all the expenses of the war research; this has amounted to several times the peacetime budget of the Howe Laboratory. But with the termination of the war contracts, there will necessarily be considerable retrenchment. It is hoped that some means may be found to increase the present endowment for additional Fellowships, and thereby salvage in the postwar era as much of the investigative talent as possible.

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